

REMARKS

Claims 15-70 are pending and stand rejected. Claims 15-70 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent No. 6,215,496 to Szeliski et al., hereinafter "Szeliski," in view of Bastos "Increased Photorealism for Interactive Architectural Walkthroughs," hereinafter "Bastos," and further in view of U.S. Patent No., 6,163,319 to Peercy et al., hereinafter "Peercy." Applicant respectfully traverses the grounds for rejection and requests reconsideration and withdrawal of the rejections of claims 15-67 in view of the claim amendments and the following. No new matter has been added. Support for the amendments can be found in the specification as originally filed at least at page 4, lines 20-22 and 26-28.

Examiner Interview

Applicant appreciates the telephonic examiner interview on October 19, 2005. During the interview, the examiner suggested claim amendments to overcome the current rejections. Applicant appreciates the examiner's suggestions.

Rejections under 35 U.S.C. § 103

Independent claims 15, 32, and 49 include features that are neither disclosed nor suggested by the cited references, either taken alone or in combination, namely as represented by claim 15:

15. (Currently Amended) A method for rendering an object having light reflective properties, the method comprising:

determining a destination viewing vector for rendering the object from a destination viewpoint;

determining a set of source radiance environment maps each having an associated source viewing vector, *each source viewing vector representing a different, specific viewpoint* associated with the source radiance environment map, each source radiance environment map including information indicative of a light reflective property of the object and comprising *texels that each represent a pre-integrated value of total reflected radiance;*

warping, on a per-texel basis, each source radiance environment map of the set of source radiance environment maps based on the destination viewing vector and the source viewing vector associated with the source radiance environment map; and

blending the warped source radiance environment maps to create a destination radiance environment map. (emphasis added)

The claims are directed to a novel technique for rendering an object whose surface has light reflective properties. Conventional rendering of such objects is performed with integration of the lighting equation for each frame rendered. Integration of the lighting equation is highly processor intensive and therefore, not conducive to interactive rendering (application as originally filed at page 2, line 1 through page 4, line 4). Bastos renders objects using BRDFs that provide a full description of the light reflective properties of the object. Bastos uses these BRDFs and performs a convolution at runtime for each frame rendered. Because a convolution is a complex process, Bastos is also a highly processor intensive.

The invention overcomes the need for *integrating the lighting equation* (or calculating the convolution of Bastos) by starting with a set of source radiance environment maps having *pre-integrated total reflected radiance values*, each map having an associated source viewing vector *representing a different, specific viewpoint*. These source radiance environment maps can be warped and blended together to provide for quick rendering of the object, without the need for integration or convolution. In this manner, an object with light reflective properties can be more quickly rendered, although possibly with some loss in accuracy as compared to full integration of the lighting equation (and the more source maps that are used, the better the quality of the rendered object).

Szeliski does not disclose or suggest source radiance environment maps that include values representative of *pre-integrated total reflected radiance*, as recited by the claims.

Bastos does not cure the deficiencies of Szeliski. Bastos does not disclose or suggest source radiance environment maps that include values representative of *pre-integrated total reflected radiance values*, each map having an associated source viewing vector *representing a different, specific viewpoint*. In contrast, Bastos uses BRDFs that each include full information about how an object responds to light, in effect, providing information about *every* viewpoint of the object.

Applicant submits that Peercy does not overcome the deficiencies of Bastos and Szeliski. While Peercy notes that filtering can be performed on bumps by computing the reflected radiance over all bumps (Peercy at 11:45-8), this is simply a statement that one can use the conventional lighting equation to determine the lighting on a bumped surface. The bump texture maps of Peercy contain only surface geometric properties (Peercy at 11:12-36) and do not contain pre-integrated total reflected radiance values (or any lighting information). Moreover, the bump texture maps of Peercy do not have an associated specific source viewing vector because the texture bump maps are not view dependent (Peercy at 11:12-36). Still further, because texture bump maps are not view dependent (i.e., they do not have an associated viewing vector), they are not amenable to warping and blending together.

Thus, Peercy simply notes that one can perform the conventional lighting equation to determine lighting on a bumped surface. Peercy a) does not disclose or suggest a source radiance environment map having a pre-integrated total reflected radiance value, b) does not disclose or suggest a source radiance map having an associated source viewing vector, and c) cannot suggest the use of any lighting information in blending and warping because of the lack of source viewing vectors (Peercy's texture bump maps are view independent).

Accordingly, applicant submits that the cited references, either taken alone or in combination, do not disclose or suggest the features of independent claims 15, 32, and 49. Additionally, inasmuch as dependent claims 16-31, 33-48, and 50-70 (which have also been rejected) are dependent from claim 15, 32, or 49, these claims are patentable over the cited references, at least by virtue of their dependency. Accordingly, applicant respectfully requests reconsideration and withdrawal of the rejections of and objections to claims 15-70 under 35 U.S.C. § 103.

Conclusion

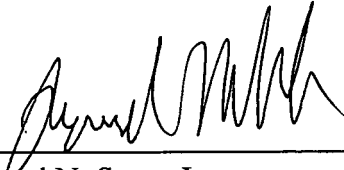
For all the foregoing reasons, applicant respectfully submits that the application is now in condition for allowance. Reconsideration of the office action and an early notice of allowance are respectfully requested. In the event that the examiner cannot allow the present application

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37 CFR § 1.116**

for any reason, the examiner is encouraged to contact the undersigned attorney, Raymond N. Scott Jr. at (215) 564-8951, to discuss resolution of any remaining issues.

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